

CLAIMS

- 1 1. An organic contaminant molecule sensor comprising: an
2 electrochemical cell having a solid state oxygen anion conductor, a
3 measurement electrode formed on a first surface of the conductor for
4 exposure to a monitored environment, and a reference electrode
5 formed on a second surface of the conductor for exposure to a
6 reference environment, the electrodes comprising material for
7 catalysing the dissociative absorption of oxygen; and means for
8 monitoring the potential difference between the electrodes, so that, in
9 the absence of organic contaminant molecules in the monitored
10 environment, the potential difference between the electrodes assumes
11 a base value V_b and, upon the introduction of organic contaminant
12 molecules into the monitored environment, the potential difference
13 assumes a measurement value V_m due to the reaction of the organic
14 contaminant molecules with oxygen in the monitored environment, $V_m -$
15 V_b being indicative of the amount of organic contaminant molecules
16 introduced into the monitored environment.
- 1 2. A sensor according to Claim 1 comprising means for controlling the
2 temperature of the cell.
- 1 3. A sensor according to Claim 2 wherein the control means comprises a
2 heater and a thermocouple arrangement.
- 1 4. A sensor according to Claim 1 wherein the material for catalysing the
2 dissociative absorption of oxygen is platinum.
- 1 5. A sensor according to Claim 1 wherein the solid state oxygen anion
2 conductor is selected from the group of materials comprising
3 gadolinium doped ceria and yttria stabilised zirconia.

- 1 6. A sensor according to Claim 1 wherein the reference oxygen
2 environment is a solid-state source of oxygen typically from a metal /
3 metal oxide couple such as Cu / Cu₂O and Pd / PdO or a metal oxide
4 /metal oxide couple such as Cu₂O / CuO.
- 1 7. A sensor according to Claim 1 comprising means for controlling the
2 oxygen electrochemical semi-permeability of the cell so as to control
3 the sensitivity of the sensor to the introduction of the organic
4 contaminant molecules.
- 1 8. A sensor according to Claim 7 wherein the oxygen electrochemical
2 semi-permeability control means comprises an additional electrode in
3 the reference environment and means for controlling the rate of flux of
4 oxygen anions flowing between the additional electrode and the
5 measurement electrode.
- 1 9. A sensor according to Claim 8 wherein the oxygen electrochemical
2 semi-permeability control means comprises means for controlling the
3 electrical current flowing between the additional electrode and the
4 measurement electrode.
- 1 10. A sensor according to Claim 7 wherein the oxygen electrochemical
2 semi-permeability control means comprises means for controlling the
3 concentration of oxygen within the reference environment.
- 1 11. A sensor according to Claim 1 further comprising means for controlling
2 the amount of oxygen within the monitored environment.
- 1 12. A sensor according to Claim 11 further comprising means for
2 controlling the pressure within the monitored environment.

1 13. A sensor according to Claim 11 further comprising means for drawing a
2 flow of gas into the monitored environment, and means for extracting
3 oxygen from gas being drawn into the monitored environment.

1 14. A method of monitoring the amount of organic contaminant introduced
2 into a monitored environment comprising: (a) providing an
3 electrochemical cell having a solid state oxygen anion conductor, a
4 measurement electrode formed on a first surface of the conductor for
5 exposure to the monitored environment, and a reference electrode
6 formed on a second surface of the conductor for exposure to a
7 reference environment, the electrodes comprising material for
8 catalysing the dissociative absorption of oxygen; and (b)(1) monitoring
9 the potential difference between the electrodes in the absence of
10 organic contaminant molecules in the monitored environment, and
11 (b)(2) monitoring the potential difference between the electrodes upon
12 the introduction of organic contaminant molecules into the monitored
13 environment where the potential difference in the presence of the
14 organic contaminant molecules is a function of the reaction of the
15 organic contaminant molecules with the oxygen in the monitored
16 environment; so that the difference between (I) the potential difference
17 between the electrodes upon the introduction of organic contaminant
18 molecules and (II) the potential difference between the electrodes in the
19 absence of organic contaminant molecules is a function of the amount
20 of organic contaminant molecules introduced into the monitored
21 environment.

1 15. A method according to Claim 14 further comprising the step of
2 controlling the temperature of the cell.

1 16. A method according to Claim 14 further comprising the step of
2 controlling the oxygen electrochemical semi-permeability of the cell so

3 as to control the sensitivity of the sensor to the introduction of the
4 organic contaminant molecules.

1 17. A method according to Claim 16 wherein the oxygen electrochemical
2 semi-permeability of the cell is controlled by controlling the rate of flux
3 of oxygen anions flowing between the measurement electrode and an
4 additional electrode in the reference environment.

1 18. A method according to Claim 17 wherein the rate of flux of oxygen
2 anions flowing between the electrodes is controlled by controlling the
3 electrical current flowing between the measurement electrode and the
4 additional electrode.

1 19. A method according to Claim 17 wherein the rate of flux of oxygen
2 anions flowing between the electrodes is controlled by controlling the
3 concentration of oxygen within the reference environment.

1 20. A method according to Claim 14 further comprising the step of
2 controlling the amount of oxygen within the monitored environment.